

PRECIOUS STONES

G. F. KUNZ

article in *cat*
Appleton's
"Physical Geography"



GEORGE W. KINZIE

ARTICLE ON PRECIOUS STONES

1875



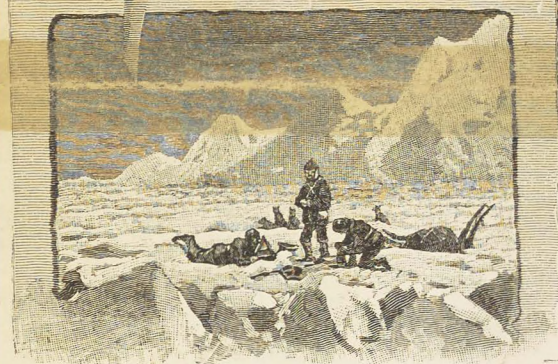
1. APPENDIX



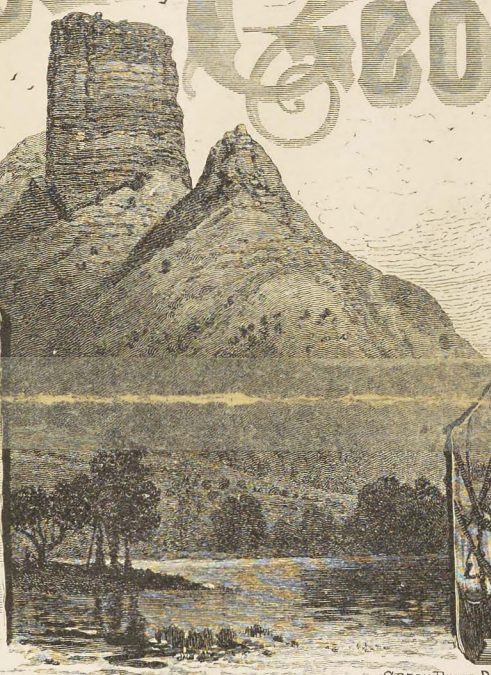
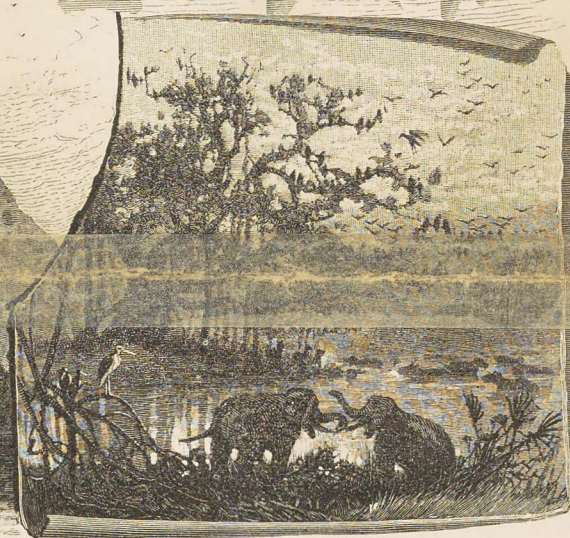
GEORGE F. KUNZ'S ARTICLE ON PRECIOUS STONES

from APPLETON'S

Physical Geography.



LOCKWOOD ISLAND

GREEN RIVER BUTTES
COLORADO.

ON THE ZAMBESI

Prepared on a New and Original Plan, richly illustrated with Engravings, Diagrams, and Maps in color, and including a separate chapter on the Geological History and the Physical Features of the United States

— BY —

JOHN D. QUACKENBOS, A. M., M. D.

*Adjunct Professor of the English Language and Literature,
Columbia College, New York (Literary Editor)*

JOHN S. NEWBERRY, M. D., LL. D.

Professor of Geology and Paleontology, Columbia Col.

CHARLES H. HITCHCOCK, Ph. D.

Professor of Geology and Mineralogy, Dartmouth Col.

W. LE CONTE STEVENS, Ph. D.

Professor of Physics, Packer Collegiate Institute

HENRY GANNETT, E. M.

Chief Geographer of the United States Geological Survey

WILLIAM H. DALL

Of the United States National Museum

C. HART MERRIAM, M. D.

Ornithologist of the Department of Agriculture

NATHANIEL L. BRITTON, E. M., Ph. D.

Lecturer in Botany, Columbia Col.

LIEUTENANT GEORGE M. STONEY

Naval Department, Washington

GEORGE F. KUNZ

*Gem Expert and Mineralogist, with Messrs. Tiffany & Co.,
New York*

D. APPLETON & CO., PUBLISHERS

Boston, Chicago

NEW YORK

Atlanta, San Francisco

COPYRIGHT, 1887, BY D. APPLETON & COMPANY

PRECIOUS STONES.

The Diamond.—The most valuable of precious stones is the diamond—pure crystallized carbon—the most highly refractive and the hardest of gems, and the only one that is combustible. This latter property was discovered in 1691 by Cosmo I. of Tuscany, who ignited the diamond with a burning-glass; and later it was found that when burned in a crucible this gem converts iron into steel. The diamond generally occurs as an octahedron, and surpasses all other gems in the property of dividing light into colored rays, causing that peculiar flash of prismatic hues called its *fire*.

Diamonds are rated by the *carat*. The term carat is derived from the name of certain small leguminous seeds which, when dried, are quite constant in weight. They were used in India for weighing gems.

In 1871, the syndicate of Parisian jewelers, goldsmiths, and gem-dealers, suggested .205 of a gramme as the value of a carat; and this was confirmed in 1877, all the leading diamond-dealers of London, Paris, and Amsterdam, accepting it. The English carat is equal to $3.1683 +$ grains (commonly reckoned as 3.17 grains) troy, hence there are $151\frac{1}{2}$ carats in an English troy ounce. The jewelers' carat is subdivided into halves, quarters, eighths, sixteenths, thirty-seconds, and sixty-fourths. A quarter-carat is called a grain; pearls are allways sold by the grain.

The earliest known mention of diamonds is supposed to be that in the Indian epic "Mahābhārata" (*mā-hah'bah'-rā-tā*), B. C. 1000. Before 1728, the date of the discovery of the Brazilian mines, all diamonds were brought from India and Borneo. There are three distinct diamond-producing regions in India; the familiar word Golconda is not the name of a mine, as popularly supposed, but merely the general term for the market where diamonds were bought and sold. To-day all the mines are nearly closed.

Indian diamonds occur in a conglomerate, and also in alluvial or superficial deposits, together with pebbles, ferruginous quartz, and jasper. Early methods of mining were very crude. The conglomerate was dug out, and carried to small square reservoirs, raised on mounds, where it was carefully washed and sorted, the wet diamonds being readily recognized by their peculiar vitreous luster.

At present India yields very few stones, while Borneo produces only about three thousand carats annually. Diamonds are also mined in New South Wales, and are met with in California, the Ural Mountains,

North Carolina, and Georgia. In 1856, the "Dewey Diamond," that cut eleven and a half carats, was found near Manchester, Virginia.

South African Diamond-Fields.—By far the greatest portion of the diamonds now obtained come from the mines of South Africa, which were discovered, near Hopetown, in 1867, by some Dutch children. They are situated in Griqualand West, now a part of Cape Colony, in latitude $28^{\circ} 40'$, longitude $25^{\circ} 10'$, east, about 640 miles northeast of Cape Town and 500 miles from the sea-coast. Although they are at an elevation of nearly 4,000 feet above the sea-level, the heat is excessive during the summer months, when the work is principally carried on. There are four

large mines, all within a radius of a mile and a half. The celebrated Kimberley covers seven and a half acres.

The African mines were originally worked in individual claims, 3,143 in number, each thirty-one feet square, with a roadway seven and a half feet wide between each pair of claims. These small claims are now consolidated into about ninety large companies and private firms having a gross capital of nearly \$50,000,000. Thirty-three million carats (over six and a half tons) of diamonds have already been taken out, valued in the rough at £45,000,000, and after cutting at £90,000,000. The absorption of the smaller

by the larger companies (*unification*) is constantly going on, and it is proposed to consolidate all the companies into one gigantic monopoly.

Ten thousand natives, each receiving one pound a week, are employed in the mines under the supervision of twelve hundred European overseers.

The enormous sum of over £1,000,000 is annually expended for labor. This mammoth investment of European capital has been profitable to the shareholder, and it would have been still more so were it not for the thievishness of the native diggers, who, instigated by the vicious whites that congregate on the fields, steal and dispose of from one-fifth to one-fourth of the entire yield. More improved methods of surveillance, recently introduced, have diminished this loss. None but authorized agents are permitted to purchase or possess rough diamonds, and a large detective force is on

the alert to prevent any infringement of the rules. The lengths to which the natives and their white accomplices go in their fraudulent traffic may be judged from the fact that chickens have been decoyed to the mines by them and made to swallow diamonds. A *post mortem* recently held on the body of a Caffre who had died suddenly, revealed the fact that death was caused by a sixty-carat diamond which the native had swallowed. (On the mines of Griqualand West, consult Leyland's "A Holiday in South Africa," p. 93.)

Theory of Formation.—At the Kimberley mines, the diamonds were first obtained on the surface in a yellow earth, the result of the decomposition of strata found 100 feet below, and known as "blue stuff." Scattered through it are angular pieces of carbonaceous shale, garnet, mica, etc. At a depth of 600 feet, a



DIAMOND-MINING.

hard rock (peridotite) was found, containing the same shale. This shale has evidently been altered by the action of heat produced by the penetration of the volcanic rock through it; and this heat, causing the liberation of some volatile hydrocarbon, has doubtless produced the diamond. The mines are so surrounded by carbonaceous shale that they form, as it were, "pipes" in the center of it.

In the Kimberley mine a depth of 600 feet has been reached. The number of obstacles which have been successfully overcome and the novel machinery in use make the mining at Kimberley the most systematic of the kind in the world. Progress has been rapid. On the site of the desert there is now a city of 25,000 inhabitants, with water-works, railroads to the coast, and many other improvements of modern civilization.

Brazilian Mines.—In Brazil, diamonds are found in several localities. At Diamantina, in Minas-Geraes, 4,000 feet above the sea, the stones occur usually in the gravel and sands resulting from disintegrated rock. Up to 1850, over 7,000,000 carats, worth £11,000,000, had been taken from the Minas-Geraes mines alone. Perhaps the entire yield from Brazil may be estimated at 13,000,000 carats, worth £20,000,000.

The beds of rivers have been turned aside to aid in the search for diamonds, but the methods of mining have always been very crude. Little machinery has been used, the work of sorting being performed by slaves, who were rewarded for any exceptional find.

Remarkable Diamonds.—Some diamonds are celebrated for their size or the interesting legends connected with them. The Regent, or Pitt diamond, weighing $136\frac{1}{4}$ carats, and originally purchased by Lord Pitt for £1,000, is the finest large diamond in the world. It was discovered in India, in 1701, and weighed 410 carats in the rough. Valued at 12,000,000 francs, it was the most precious of the French crown jewels, and was one of the few retained by the government at the great sale in 1887.

The finest blue diamond is the "Hope," which is almost sapphire-blue and weighs $44\frac{1}{2}$ carats. It is an Indian stone and evidently part of Tavernier's blue diamond which was stolen from the Garde Meuble in 1792. It was purchased by Mr. Henry Hope for £18,000. The Dresden Green Vaults contain the finest green diamond, a pear-shaped $48\frac{1}{2}$ carat brilliant, the "Dresden Green."

Among the largest diamonds is the Orloff in the scepter of the Emperor of Russia, weighing 193 carats. It is fabled once to have formed the eye of an Indian idol, and to have been stolen by a French deserter. In the Russian treasury is also the Shah, 86 carats. Tavernier's Great Table weighed $242\frac{5}{16}$ carats.

The Tiffany yellow diamond, the largest diamond in America, is a flawless double-cut brilliant. It was found in South Africa, weighs $125\frac{3}{8}$ carats, is of a rich orange-yellow color, and is the finest yellow diamond in the world. It is valued at \$100,000.

The "Great Mogul" was described by Tavernier, the famous traveler, in 1678. He states that its weight was originally $793\frac{3}{8}$

carats, but in cutting it was reduced to $279\frac{9}{16}$ through the stupidity of the cutter, who is said to have been fined his entire fortune for his carelessness. This magnificent stone was named after the founder of the so-called Mogul dynasty in India. It has disappeared, though some identify it with the Koh-i-Nûr (*Mountain of Light*), which weighed when first brought to England, 186 $\frac{1}{16}$ carats, but was reduced by recutting, in 1852, to $106\frac{1}{16}$ carats. The Koh-i-Nûr, "the great diamond of romance," is now among the English crown jewels. Barbot valued it before recutting at £140,000.

A diamond, weighing $457\frac{1}{2}$ carats, was brought from the Cape in 1884; it has been cut into a brilliant of 180 carats, valued at £200,000.

The finding of this stone is enveloped in mystery. The name "Victoria" was given to it in honor of the queen, and it is undoubtedly the largest brilliant in the world. (*Read Streeter's "The Great Diamonds of the World."*)

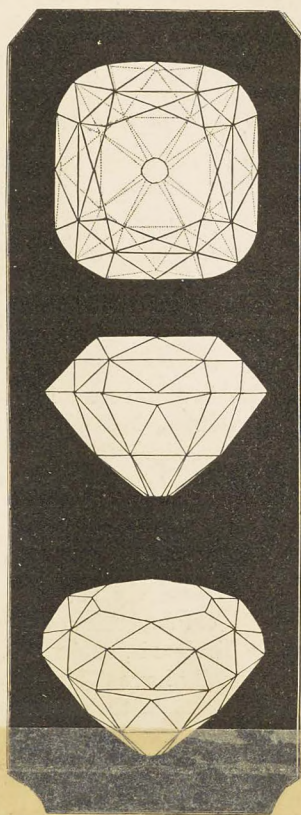
Value of Diamonds.—In diamonds, perfectly white stones or decided tints of red, rose, green, or blue, are most highly prized. Fine cinnamon, and salmon or brown, black or yellow stones, are also esteemed. If flawless and without tint of any kind, they are termed "first water." If they possess a steely-blue color, at times almost opalescent, they are called blue-white. Such are usually Brazilian stones. Exceptionally perfect stones are termed gems, and for such there is no fixed value, the price depending on the purity and the brilliancy of the stone.

The term "first water" varies in meaning according to the class of goods carried by the dealer using it. It is impossible to estimate the value of a diamond by its weight—color, brilliancy, cut, and general perfection of the stone, are all to be taken into account. Of two stones, both flawless and weighing ten carats, one may be worth \$600, and the other \$12,000. Exceptional stones often bring special prices, whereas off-color or imperfect stones sell at from \$50 to \$75 per carat, regardless of size.

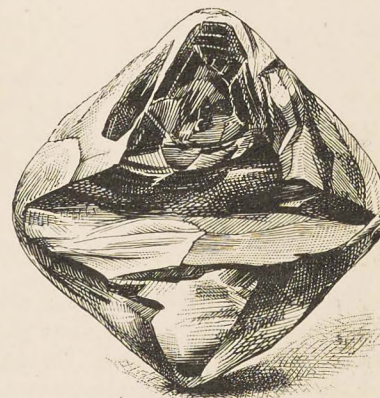
The probable value of all the diamonds in the world is about \$1,000,000,000. The world's diamond-trade is carried on by about eight thousand dealers, with a total stock of not far from \$350,000,000. The stones are prepared for market by, perhaps, forty-five hundred cutters and polishers, principally in Amsterdam, Antwerp, Paris, and the Jura. A limited amount of cutting is also done in England and the United States.

The Ruby and the Sapphire are varieties of the species corundum. The yellow variety is known as Oriental topaz, the green as Oriental emerald, and the purple as Oriental amethyst. The two latter forms are rare. The sapphire belongs to the hexagonal system, is next to the diamond in hardness, and is composed of nearly pure alumina.

The most highly valued rubies, which are of the color of pigeon's blood, are found near Mandalay, in Burmah. In Ceylon they occur of a lighter color, and in Siam of a very dark red. Although the diamond is more generally esteemed, the rarity of rubies of from three to four carats' weight is such that they are worth five to ten times as much as diamonds of the same size. The choicest colors of the sapphire are the cornflower and the velvet-blue.



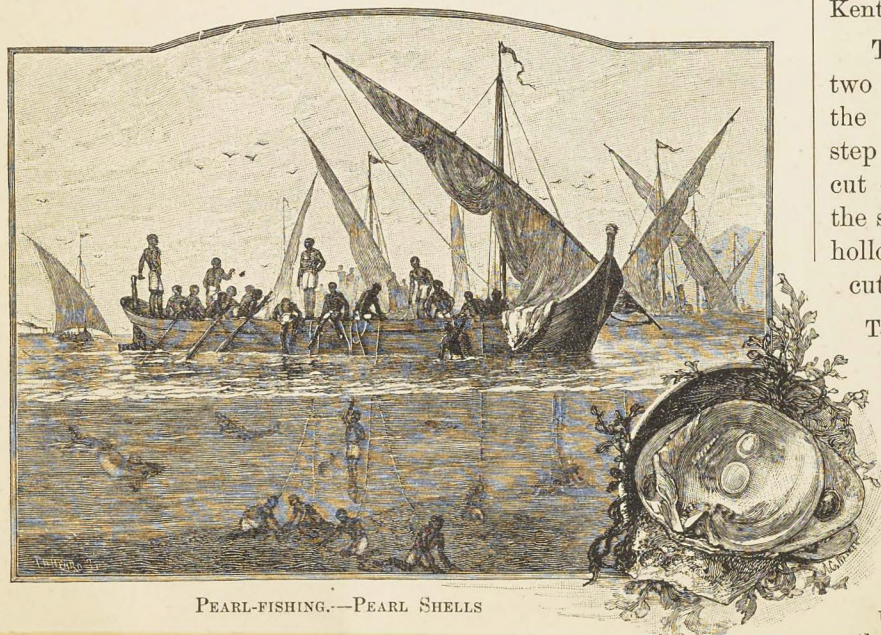
THE TIFFANY DIAMOND.
NATURAL SIZE. CROWN, SIDE,
AND ANGULAR VIEWS.



THE VICTORIA DIAMOND, IN THE ROUGH.
NATURAL SIZE.
(From a photograph.)

The Chrysoberyl gems, next to the sapphire in hardness, include the varieties of yellow, brown, green, and an endless number of intermediate shades. The variety of chrysoberyl in which impurities are found between the layers, or the layers are so arranged by twinning that, if the stone is cut across the layers, the light is condensed in an even line, is called chrysoberyl cat's-eye.

Beryl is a silicate of glucina and alumina. Golden-colored beryl is found in Maine, Pennsylvania, and Connecticut. When the beryl is



PEARL-FISHING.—PEARL SHELLS

colored with chromium, we have the emerald. The finest emeralds are from the Muso mine, near Bogotá, where they occur in a rock containing bituminous concretions filled with fossils. This mine has been worked for the past three centuries by Europeans, and was previously operated by natives and ancient Peruvians.

Some of the finest crystals of emerald known have been found in Alexander County, North Carolina; one weighing ten ounces, but of small gem value, has been found there. When really fine and flawless, emeralds rank with diamonds in value. (See George F. Kunz's "American Gems.")

Topaz occurs yellow, blue, cherry, green, and white. Tourmalines are found in Brazil, Siberia, and in remarkable perfection at Paris and Auburn, Maine.

Quartz gems are pure silica colored by iron or other oxides. When pellucid the crystalline varieties are called rock-crystal; when colored purple or violet by oxide of manganese, amethyst. The crypto-crystalline varieties of quartz are chalcedony, gray, bluish-gray, or brown, with a waxy luster. When banded with rock-crystal, jasper, etc., it is called agate. When translucent like horn, yellow, yellowish-brown, or red, it is called carnelian. When in bands of white, gray, and other colors, it is called onyx (used for cameos); with moss-like markings produced by oxide of manganese or iron, moss-agate. Moss-agate occurs in immense quantities in parts of the West; agatized wood (in which the wood-fibers are changed to agate by the infiltration of silicious waters) is found in Arizona and the Yellowstone Park.

Noble opal is milky, almost opaque, with a play of brilliant, red, green, orange, and other hues. Hungary, Honduras, and Mexico, are the localities for this stone. When yellow, red, and green colors combine like flashes of fire, the name fire-opal is given to it. This species is found mostly in Mexico. California furnishes beautiful opalized wood.

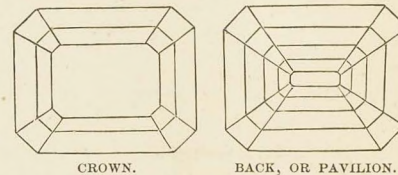
Pearls are small bodies found either in mother-of-pearl shells or in those with a nacreous lining. They are formed either by a disease, by the presence of a parasite, or by an effort on the part of the mollusk to rid itself of some foreign substance which has found its way into the shell.

Pearls are composed of many layers of carbonate of lime with organic matter between, are not always entirely pearly throughout,

and invariably have some small central core or nucleus. Round pearls of fine luster and color are very valuable, and their value increases rapidly with their size.

The finest white pearls are from India, the Persian Gulf, and Panama; the finest black and gray pearls, from the coast of Lower California. Beautiful pink-tinted pearls are often secreted by the common brook-mussels. One valued at over \$2,000 was found near Paterson, New Jersey, in 1856, and quite a number have been met with in Ohio, Tennessee, Kentucky, and Texas, and also in England, Scotland, and Germany.

The Forms in which Gems are cut, are divided into two groups—those with plane and those with round surfaces. To the first belong the brilliant, step or trap cut, and the table-cut or rose-cut; to the second, the single, the double, and the hollow cabochon or carbuncle cut.



CROWN.

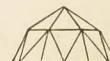
BACK, OR PAVILION.

STEP OR TRAP CUT.

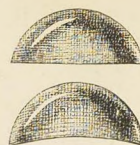
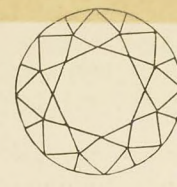
The brilliant cut is usually modified, but when perfect

fifty-eight facets are required—thirty-three constituting what is called the crown or upper part, the large facet being termed the table, and twenty-five the back, pavilion, or base. The small facet at the bottom is called the collet or culet, and the edge of the stone the girdle. This form of cut is most extensively used for diamonds, but is occasionally employed for other stones.

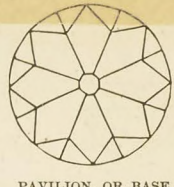
Emeralds, rubies, sapphires, and other colored stones, usually have the step-cut, so called from the fact that the facets on the crown are in a step-like series, and below the girdle are three or more diminishing zones terminating in a culet. The en-



ROSE.

SINGLE, HOLLOW, AND DOUBLE
CABOCHON.

CROWN.

PAVILION, OR BASE,
SHOWING COLLET.

BRILLIANT CUT.

cabochon or carbuncle cut is that in which the top is rounded off and the back flat, hollowed out, or the same as the top. Garnets, turquoises, opals, cat's-eyes, are cut in this manner. In the rose-cut, the back is flat and the top covered with triangular facets generally from twelve to twenty-four in number.

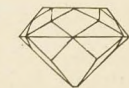
Imitation Stones.—Rhine stones, the Lake George, California, Swiss, and Swedish diamonds, with the so-called diamond-coated stones, are all paste or lead glass.

These imitations have been recently improved by the addition of little metal cups or coatings filled with mercury, for which reason they are known as foil-backs, brilliants, etc., but the hardness of all is below that of flint-glass. Paste gems are made of silica and oxide of lead, colored with metallic oxides to produce the required shade of color.

In doublets, the crown is made of quartz, garnet, or some equally cheap and hard stone; but all below this is paste of the desired color, the two parts being joined by cement or fire.

Imitation pearls are small, blown spheres of slightly opalescent glass, roughened and lined with a preparation made from the scales of a small fish found in Switzerland (the bleak), and then filled with wax.

Questions.—What can you say of the diamond; its value; the theory of its formation; the localities at which it is mined? Describe some remarkable diamonds. What are rubies? Sapphires? Emeralds? Where are these stones obtained? Name and describe other precious stones used as ornaments. What are pearls, and whence are they obtained? Describe the forms in which gems are cut. How are imitation stones made?

BRILLIANT CUT.
SIDE VIEW.





